A Field Research Opportunity for an Agricultural Systems Undergraduate Student

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Background

Applying nitrogen fertilizer to corn is necessary in order to produce a good crop, but is expensive for farmers and degrades water quality. The living mulch system is a new crop production system in which corn is planted using no-till methods into a field of established Durana white clover. The clover, a legume, produces nitrogen for the corn to use. This system has the potential to decrease mineral N use and improve water quality in high-yield a corn production system.

Objective

We sought to determine the relationship between corn and Durana white clover by examining how corn height influences the amount of light available to the clover (light interception), and how light interception influences clover mass.

Methods

Corn was established on a 90-cm row width and a population density of 89,000 plants/ha.

Clover mass was measured using a calibrated rising plate meter (RPM) (calibrated using frame quadrats) (Figure 2).

Quantum light was measured above and below the corn canopy with a Licor LI-191 Line Sensor (Figure 3) and % light interception calculated.

Corn height was measured using a 300-cm stick ruler. All data were measured weekly from April 19 through July 5, 2016.

Results

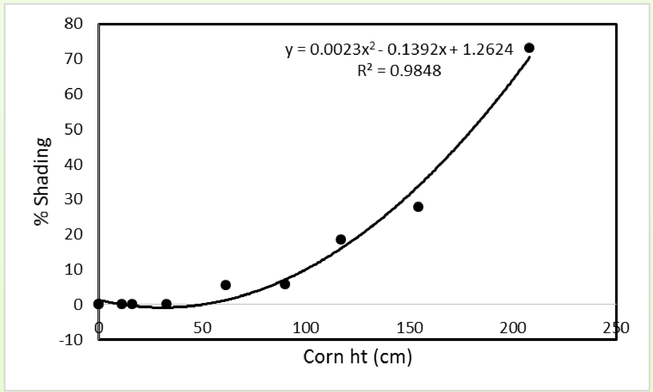

Figure 1: Light interception increased as the corn grew, thus, shading the clover.

Figure 2 Using the RPM to measure clover mass

Figure 3: Measuring light interception (shading).

Results

Increased corn height increased light interception and, therefore, shading to the clover. This was a very predictable response (ie. High R^2) (Figure 1).

Corn shading had an inverse relationship with clover mass (Figure 4).

Results (cont.)

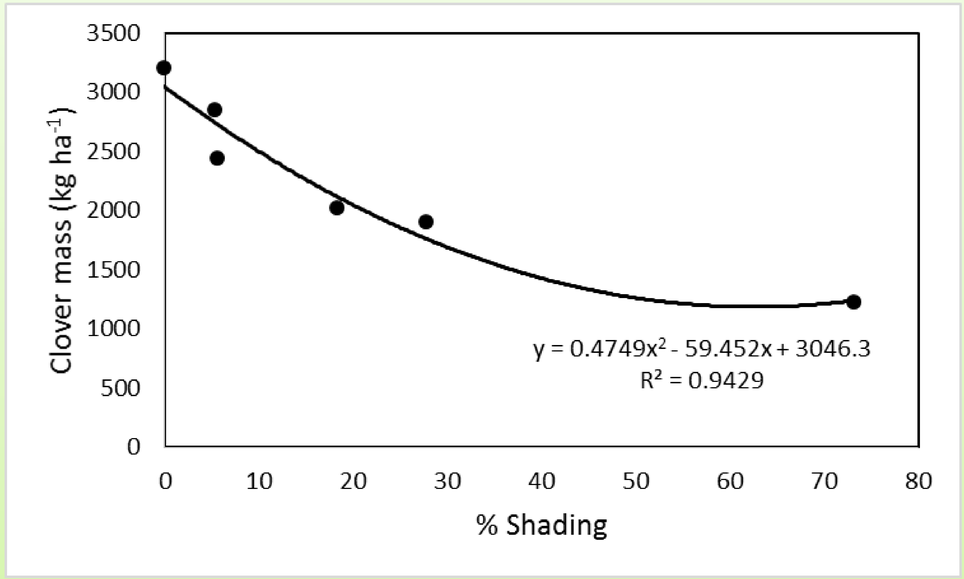

Figure 4 : As percent shading increased, clover biomass decreased.

Conclusion

Light interception increased with corn height which caused clover to senesce its leaves. It is hypothesized that the nitrogen from the senesced and decaying clover will be taken up by the corn. In order to test this, corn and clover were sampled and will be analyzed for their nitrogen content to validate the hypothesis.

Personal Experience

This project has instilled in me an understanding of science and the way we can use it to solve agricultural problems. I am thrilled to have worked on a project that, when completed, will benefit growers and the environment by providing an alternative to synthetic nitrogen.

Acknowledgements

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